

Remarks

Applicants respectfully request favorable reconsideration of the present application in view of the below remarks. Claims 28 to 68 are pending in this application. Claims 28, 45 and 56 are the independent claims. Favorable reconsideration and further examination are respectfully requested.

Rejections under 35 USC 112, Second Paragraph

Claims 28-29, 32, 45-46, 49, 56, 61, and 66 were rejected under 35 USC 112, second paragraph, as being indefinite because of the use in the claims of the terms “substantial” and “substantially.” The language objected to in each claim is listed in the following table, presented in context:

Claim	Relevant Language [emphasis added]
28	“the logical configuration of the second volume group is <u>substantially</u> identical to the logical configuration of the first volume group”
29	“the computer-executed steps may be performed <u>substantially</u> independent of which operating system is selected from the group”
32	“building a second volume group on the second computing system that is a <u>substantial</u> copy of the first volume group on the first computing system”
45	“where the logical configuration of the second volume group is <u>substantially</u> identical to the logical configuration of the first volume group”
46	“the computer-executed steps may be performed <u>substantially</u> independent of which operating system is selected from the group”
49	“building a second volume group on the second computing system that is a <u>substantial</u> copy of the first volume group on the first computing system”
56	“the logical configuration of the second volume group is <u>substantially</u> identical to the logical configuration of the first volume group”
61	“the first operating system is <u>substantially</u> the same as the second operating system”
66	“the first operating system is <u>substantially</u> the same as the second operating system”

The Examiner views the usage of these terms in the claims as being a use of "relative terms" that allegedly render the claims indefinite because, the Examiner contends, the claims allegedly do not define the terms, the specification allegedly does not provide a standard for ascertaining "the requisite degree" and, it is alleged, "one of ordinary skill in the art would not be reasonably apprised of the scope of the invention."

Applicants believe that the Examiner may be mistaken in his interpretation of the terms "substantial" and "substantially" in construing the claims and in his assertion that use of such terms is indefinite. First of all, the applicable case law states that:

Expressions such as "substantially" are used in patent documents when warranted by the nature of the invention, in order to accommodate the minor variations that may be appropriate to secure the invention. Such usage may well satisfy the charge to "particularly point out and distinctly claim" the invention, 35 U.S.C. §112, and indeed may be necessary in order to provide the inventor with the benefit of his invention. In Andrew Corp. v. Gabriel Elecs. Inc., 847 F.2d 819, 821-22, 6 USPQ2d 2010, 2013 (Fed. Cir. 1988) the court explained that usages such as "substantially equal" and "closely approximate" may serve to describe the invention with precision appropriate to the technology and without intruding on the prior art. The court again explained in Ecolab Inc. v. Envirochem, Inc., 264 F.3d 1358, 1367, 60 USPQ2d 1173, 1179 (Fed. Cir. 2001) that "like the term 'about,' the term 'substantially' is a descriptive term commonly used in patent claims to 'avoid a strict numerical boundary to the specified parameter,'" quoting Pall Corp. v. Micron Separations, Inc., 66 F.3d 1211, 1217, 36 USPQ2d 1225, 1229 (Fed. Cir. 1995). It is well established that when the term "substantially" serves reasonably to describe the subject matter so that its scope would be understood by persons in the field of the invention, and to distinguish the claimed subject matter from the prior art, it is not indefinite. Understanding of this scope may be derived from extrinsic evidence without rendering the claim invalid.

See Verve, LLC v. Crane Cams, Inc., 311 F.3d 1116, 1120, 65 USPQ2d 1051, 1054 (Fed. Cir. 2002) [emphasis added]:). Regarding context and extrinsic evidence of meaning, Verve also explains that:

Resolution of any ambiguity arising from the claims and specification may be aided by extrinsic evidence of usage and meaning of a term *in the context of the invention*. The question is not whether the word “substantially” has a fixed meaning as applied to “constant wall thickness,” but how the phrase would be understood by persons experienced in this field of mechanics, upon reading the patent documents.

Verve at 3111 F.3d 1119, 65 USPQ2d 1053 [emphasis added]. In accordance with Verve's legal authority, Applicants maintain that one of skill in the art would readily ascertain the scope of the invention and the intended meanings of the terms listed in the table above, based at least on the Specification, the context of the claims, and on the knowledge common and standard to the art.

For example, in the instances where claims 28, 45, and 56 refer to a logical configuration of a second volume group being “substantially identical” to the logical configuration of a first volume group, and where claims 32 and 49 refer to building a volume group that is a “substantial copy” of another volume group, Applicants maintain that one of skill in the art understands, based on the context, what is intended by a “substantial copy” and “substantially identical”. As one possible example, consider where a second volume group includes all of the information of a first volume group but may have necessarily differing information as well, such as a different creation date, or information identifying the computer system on which the second volume group is located (where the computer system where the first volume group is located might be different than that of the second volume group). In this example, because of the minor identification differences, the second volume group might not be an “exact” copy of the first volume group, but one of skill in the art recognizes that the second volume group essentially includes nearly all of the information of the first volume group and is, effectively, a copy – what can be recognized to be a *substantial copy*.

To paraphrase Verve, the question is not whether the word “substantial” has a fixed meaning as applied to “copy” or whether “substantially” has a fixed meaning as applied to “identical,” but rather how the phrases “substantial copy” and “substantially identical” would be

understood by persons experienced in the field (e.g., backup storage systems), upon reading the patent documents. To help further the Examiner's understanding of this point, Applicants hereby provide extrinsic evidence in the form of other patent documents relating to the general area of backup storage systems, which patent documents can help to show how such terms very similar to those the Applicants use apparently are presumed to be understood by those of skill in the art.

As a first illustrative extrinsic evidence example showing usage in the art, consider U.S. Patent No. 7024586, entitled, "Using file system information in raid data reconstruction and migration" to Kleiman et al. ("Kleiman '586). Note that Kleiman '586 is a patent that shares an inventor and assignee with the two other Kleiman patents that the Examiner has cited elsewhere in the Office Action. Kleiman '586 includes the following language in the specification, at col. 11, lines 32-43 [emphasis added]:

"Because the target system 310 has target RAID stripes 340 that are logically identical to the source RAID stripes 330, the target system 310 can determine that all its own unallocated blocks 342 are unallocated at the source storage system 305. The target storage system 320 can therefore set all those unallocated blocks 342 to zero values, using the SCSI "write same" command.

As a result, *the target storage system 320 will be substantially identical to the source storage system 305* after the data blocks are sent, received, and stored; hence, the mirror relationship between the source storage system 305 and the target storage system 320 is reestablished

Nowhere in Kleiman '586 is the meaning or degree of "substantially identical" explained or further clarified – because one of skill in the art is assumed to know and understand the meaning of "substantially identical."

As another extrinsic evidence example, consider U.S. Patent No. 6,675,177 to Webb ("177 patent"), entitled "Method and system for backing up digital data," which includes claims that recite limitations such as:

"storing a substantially complete copy of the files on said backup server" (claim 1);

“wherein said resulting backup volume is substantially equivalent to a full backup volume” (claim 3);

“wherein said steps of . . . storing a substantially complete copy of the files on said backup server are performed substantially by said backup server” (claim 5)

“storing a substantially complete copy of the created or modified files on the backup server” (claim 7)

The Specification of the ‘177 patent does not explain the “requisite degree” of the “substantially complete copy”, “substantially equivalent,” or “performed substantially” language of the claims. The only two relevant statements made in the ‘177 patent appear to be “*The resulting full backup volume is substantially identical to one that would have been taken from the client at the same point in time by performing a traditional level 0 backup*” (col. 4, lines 24-27 of ‘177 patent); and “*The invention can, for example, merge all incremental data gathered from the client in the backup cache with a prior, full data backup stored on a storage device (such as on tape) to produce a new, full backup volume. This new backup volume is substantially identical to one that would have been taken from the backup client at that time*” (col. 13, lines 54 – 61 of ‘177 patent).

In a still further example of usage in the art, consider still *another* patent issued to Kleiman and having the same assignee, namely, U.S. 6915447, entitled “File Server Storage Arrangement.” (“Kleiman ‘447”). Kleiman ‘447, states at col. 6, lines 23-29 [emphasis added] that:

“The first file server 110 performs the file server requests to modify one or more primary mass storage devices 120 under its control. The first file server 110 also performs the file server requests to modify a set of mirror mass storage devices 120 under its control, but located distant from the primary mass storage devices 120. Thus, the mirror mass storage devices 120 will be a **substantial copy** of the primary mass storage devices 120”.

In Kleiman ‘447, the term “substantial copy” is again used by itself, without further clarification anywhere else in the patent as to degree or scope, because one of skill in the art readily comprehends its meaning based on the context and on knowledge common in the art.

As still another example of usage of “substantially independent” (as in claims 29 and 46) in the art, consider U.S. Patent No. 5018060 to Gelb et al. (“‘060 patent”), entitled “Allocating data storage space of peripheral data storage devices using implied allocation based on user parameters.” Claim 3 of the ‘060 patent recites [emphasis added]:

In the machine-effected method set forth in claim 2, including the machine-executed steps of:

 after automatically selecting said one of the storage machine-sensible indicia represented storage groups, automatically allocating data storage space on at least one of the volumes which is a member of the selected storage group, such automatic allocation being ***substantially independent*** of the automatic class selections; and
 automatically storing said unit of data in said selected volume

Claim 3 is the only instance in the entire ‘060 patent where the phrase “substantially independent” appears. Nowhere in the ‘060 patent is there does there appear to be any explanation or further clarification as to what the “degree” of substantially independence between the “automatic allocation” and the “automatic class selections” constitutes in the recited step. Once again, it appears that it is presumed that one of skill in the art will understand the meaning of “substantially independent” based on the context and patent information.

In still a further example, consider claims 60 and 61, where the claims each recite that “the first operating system is substantially the same as the second operating system.” Use of the term “substantially” helps to account for the normal variations appropriate to the technology of operating systems that one of skill in the art would be familiar with: e.g., the first operating system might be IBM AIX Version 1.0.1 and the second operating system might be IBM AIX Version 1.0.1.2 – these two operating systems are indeed “substantially” identical, notwithstanding the minor differences that could result from their having differing version numbers. Thus, one of skill in the art clearly would appreciate and readily understand the meaning of “substantially identical” in the context of first and second operating systems of claims 60 and 61.

For at least the reasons discussed above, and based at least on the above extrinsic evidence examples, Applicants maintain that one of ordinary skill would be reasonably and readily apprised of the scope of claims 28-29, 32, 45-46, 49, 56, 61, and 66. Moreover, the usage and context of the terms “substantial” and “substantially”, especially as used in these claims in referring to substantial copies, substantially identical, substantially independent, etc, is well understood in context and known in the art. Accordingly, Applicants respectfully request that the rejection of claims 28-29, 32, 45-46, 49, 56, 61, and 66 under 35 USC 112, second paragraph, as being indefinite, be withdrawn.

Rejections Under 35 USC 103(a)

Rejections of claim 28, 45, and 56

Claims 28, 45, and 56 stand rejected under 35 USC 103(a) as being unpatentable over U.S. 6574591 to Kleiman et al. (“Kleiman ‘591”) in view of U.S. 6604118 to Kleiman et al. (“Kleiman ‘118”). Claim 28 recites [emphasis added]:

A method for managing data that may be replicated from one or more volumes of data that are part of a first volume group on a first computer system having a first operating system, the method comprising the computer-executed steps of:

discovering logical information related to the one or more volumes of data that are part of the first volume group on the first computer system;

creating a map of the logical information to physical devices on the first computer system, the map comprising:

information identifying one or more devices associated with one or more physical volumes containing the data; and

information providing definition and structured layout of volume groups, internal logical volumes and file systems on the first computer system;

using the map to create a second volume group on a second computer system having a second operating system, where the logical configuration of the second volume group is substantially identical to the logical configuration of the first volume group; and

using the map to reconstruct on the second computer system the internal logical volumes and file systems of the first computer system and mount a duplicate of the one or more volumes of data on the second computer system.

The applied art is not understood to disclose or to suggest the foregoing features of claim 28. The Examiner contends that Kleiman '591 teaches all the limitations of claim 28 except the italicized portions of claim 28; namely:

- (1) using the map to create a second volume group on a second computer system having a second operating system, **where the logical configuration of the second volume group is substantially identical to the logical configuration of the first volume group**; and
- (2) using the map to **reconstruct on the second computer system the internal logical volumes and file systems of the first computer system** and mount a **duplicate of the one or more volumes of data** on the second computer system.

Not only does Kleiman '591 not teach limitations (1) and (2) above, but, further, Applicants point out that Kleiman '591 teaches directly away from the above two limitations. Indeed, *Kleiman '591 repeatedly teaches directly and expressly away from any type of limitation where a logical configuration of a first and second group are identical or substantially identical.* For example, Kleiman '591 first states at col. 1, lines 50-55 [emphasis added]:

It would be advantageous to provide a technique that efficiently copies storage blocks from the source file system (arranged according to a first storage block arrangement) to the destination file system that is arranged according to a second storage block arrangement that differs from the first storage block arrangement.

Continuing on this emphasis of differing logical configurations, col. 3, line 65 through col. 4, line 7, Kleiman '591 states [emphasis added]:

One aspect of the invention transfers data from physical storage blocks that make up a source file system on a first block-oriented media to a second block-oriented media **without requiring that the same physical block arrangement be used on the second block-oriented media as the first**. Thus, a first storage block arrangement defines the file structure of the source file system and a second storage block arrangement defines the file structure of the destination file system and the **first storage block arrangement and the second storage block arrangement are different**.

Still another example of Kleiman '591's emphasis on differing logical configurations is the use in Kleiman '591 of the so-called "swizzling" technique. Kleiman '591 defines "swizzling" at col. 4, lines 8-15, as

*a process that re-maps block numbers (BNs) so that file system storage blocks can be stored at **different locations** on the destination file system than they are on the source file system. Swizzling allows an image transfer from a first file system to a second file system when some of the storage blocks used on the first file system cannot be transferred to corresponding storage blocks on the second file system."* [emphasis added]

The above-described examples and embodiments are completely opposite to the limitations of claim 1 that the Examiner admits Kleiman '591 does not contain. In fact, Kleiman's teaching use of "swizzling" seems particularly contradictory to claim 28's requirement that: "the logical configuration of the second volume group is substantially identical to the logical configuration of the first volume group".

Claim 28 requires that the first and second volume groups have the same logical configuration, whereas Kleiman '591 expressly recites that the block arrangements are intended to be different. Because Kleiman '591 is so very clear in its repeated emphasis on differing logical configurations between a source file and a copy of that file, Applicants maintain that one of skill in the art would have no reasonable expectation of success in using the teachings of Kleiman '591 and then modifying these teachings, whether with Kleiman '118 or any other reference, in such a way as to completely change the principle of operation of Kleiman '591.

In an attempt to compensate for the deficiencies of the Kleiman '591 reference, the Examiner relies on Kleiman '118. The Examiner cites the following passage of Kleiman '118 as allegedly teaching both the limitations (1) and (2) above that are admittedly not taught in Kleiman '591:

Select a storage image 220, in response to a first file system (or a snapshot thereof) to have an operation performed thereon. Form an image stream 230 in response to the storage image 220. Perform an operation on the image stream 230, such as backup or restore within the first file system, or copying or transfer to a second file system.

Based on the above passage, the Examiner asserts that Kleiman '118 teaches selecting a so-called "storage image". In this assertion the Examiner apparently equates the storage image of Kleiman '118 with the volume group of claim 28. As explained further below, however, the storage image of Kleiman '118 is absolutely not the same thing as the volume group of claim 28.

Kleiman '118 defines a storage image as comprising a set of storage blocks to be copied from the [source] file system to the destination file system (Kleiman '118 at col. 5, lines 55-58). The Kleiman '118 storage image includes an indicator of a set of storage blocks selected in response to one or more snapshots (Kleiman '118 at col. 5, lines 27-28). Kleiman '118 further states that a file system includes a set of storage blocks, each of which is stored either in memory or mass storage (Kleiman '118 at col. 3, lines 60-64). Because Kleiman '118 defines a storage image as a set of storage blocks, and further defines a storage block to be part of a file system, the storage image of Kleiman '118, is, by definition, part (or all) of a file system. Indeed, Kleiman '118 states expressly at col. 14, lines 20-22 that "the storage image 220 selected can be a complete file system or can be a subset thereof."

Thus, Kleiman '118 merely references copying a first *file system* to a second *file system*. As those of skill in the art are well aware, however, file systems are not the same thing as volume groups and logical volume information. As Applicants have mentioned in previous responses and as is well-known in the art, filesystem information generally is very different than volume-level information (e.g., volume groups, logical volumes). A filesystem is the structure in which files are named, stored, and organized, such as a structure or collection of files (e.g., a directory tree, an arrangement of files on disk partitions). Even though filesystems could, theoretically, be the same between two different operating systems, the volume definitions and other volume-level information are very different between two different operating systems. .

This is explained with greater particularity in Applicants' Specification as filed on page 12, line 16 through page 15, line 12 and also at page 17, line 10 through page 18, line 15. In brief, as is well-known in the art, a physical disk is formatted into a physical volume, and a physical volume is split into discrete chunks called physical extents; physical extents can be mapped one-to-one to logical extents. A volume group, which is a collection of disks treated as one large storage area, can represent a combination or group of physical volumes. Further, because of the one-to-one mapping, the volume group also can represent a collection of logical extents. A logical volume is some number of physical extents allocated from a single volume group. A logical volume itself can be made into a physical file system that provides information relating to the arrangement of files on disk partitions, but the resultant physical file system made from the logical volume will not necessarily include information providing definition and structured layout of volume groups, other logical volumes, and other file systems. Thus, the file systems and the storage image of Kleiman '118 that are being created on a second computer system are not equivalent to the volume group of claim 28.

The Examiner cites additional passages in Kleiman '118 as allegedly providing motivation to combine Kleiman '118 with Kleiman'591. In particular, the Examiner cites Kleiman at col. 1, lines 59-61, a passage that refers to duplicating all or part of a file system via consistent "snapshots" (copies) of a file system that are maintained so that the consistent snapshots can be transferred at a storage block level using the file servers own block operations. Col. 4, lines 18-46 of Kleiman '118 describe a so-called "snapshot", where the snapshot is:

a set of storage blocks, the member storage blocks forming a consistent file system, disposed using a data structure that allows for efficient set management . . . the data structure for the snapshot is stored in the file system so there is no need to traverse the file system tree to recover it. In a preferred embodiment, each snapshot is stored as a file system object, such as a blockmap. The blockmap includes a bit plane having one bit for each storage block, other than bits used to identify if the storage block is in the active file system

The snapshot of '118 does not seem to be used in the same way as the map of claim 28 (i.e., to reconstruct on the second computer system both the internal logical volumes and file systems of the first computer system). Rather, Kleiman '118 relates to copying file system information, not volume level information. In particular, Kleiman '118 says specifically that the snapshot is different than an active file system because the snapshot is a read-only copy of the file system, whereas the file system is a consistent file system that is used, modified, and updated frequently; the snapshot are used "for backup and mirroring of the file system" (Kleiman '118 at col. 6, lines 8-26). Thus, the snapshot is a copy of the file system only, not the logical volume information, definition and structured layout of volume groups, internal logical volumes, etc., that are part of the "map of the logical information to physical devices" of the invention of claim 28.

Applicants additionally note that even if the information of Kleiman '118 is transferred at the storage block level, the actual information being transferred is not information that can "reconstruct on the second computer system the internal logical volumes and file systems of the first computer system and mount a duplicate of the one or more volumes of data on the second computer system," as required by claim 28. It is only file system information, which is simply not the same.

Accordingly, for at least the reasons described above, Applicants argue that the combination of Kleiman '118 and Kleiman '591 still fails to teach or suggest all of the limitations of claim 28, because Kleiman '118 and Kleiman '591, taken individually or in combination, still fail to teach the limitations (1) and (2) of claim 28 described previously. Thus, Applicants maintain that claim 28, together with all claims dependent therefrom (namely, claims 29-44 and 59-64) are patentably distinguishable over Kleiman '591 and Kleiman '118, taken alone or in combination. Accordingly, Applicants respectfully request that the rejection of claims 28-44 and 59-64 be withdrawn.

Independent claims 45 and 56 contain limitations similar to those of claim 1, and, regarding claims 45 and 56, the Examiner has similarly admitted that Kleiman '118 fails to teach or suggest:

- (1) using the map to create a second volume group on a second computer system having a second operating system, **where the logical configuration of the second volume group is substantially identical to the logical configuration of the first volume group**; and
- (2) using the map to **reconstruct on the second computer system the internal logical volumes and file systems of the first computer system** and mount a **duplicate of the one or more volumes of data** on the second computer system.

For at least the reasons argued above in connection with claim 28, Applicants likewise maintain that claims 45 and 56, together with all claims dependent therefrom (namely, claims 44-54;65-68 and 57-58, respectively) are patentably distinguishable over Kleiman '591 and Kleiman '118, taken individually or in combination. Accordingly, Applicants respectfully request that the rejection of claims 45-58 and 65-58 be withdrawn.

Rejection of claims 29-44, 46-66 57-68

Claims 29-44, 46-55, and 57-68 stand rejected under 35 US C 103(a) over Kleiman '591 in view of Kleiman '118 and further in view of Markson et al. (US 20020103889A1) ("Markson"). Each of claims 29-44, 46-55, and 57-68 depends from one of the independent claims 28, 45, and 56. As argued above in connection with these independent claims, Kleiman '591 and Kleiman '118, taken individually or in combination, still fail to teach each and every limitation of each of these independent claims.

Markson is directed to a method for selectively and logically adding storage to host features dynamically by mapping one or more disk volumes to the host using a storage virtualization layer (emphasis added, see Abstract of Markson). As shown in FIG. 2C, Markson focuses on increasing storage capacity. Markson does not disclose or suggest using the mapping to duplicate volumes of data; but rather, Markson is mapping new storage with empty volume

locations for new data. None of these cited paragraphs disclose or suggest duplicating much less using the map to reconstruct on the second computer system the internal logical volumes and file systems of the first computer system and mount a duplicate of the one or more volumes of data on the second computer system (emphasis added). Thus, Markson does not compensate for the insufficiencies of the Kleiman '591 and Kleiman '118 references.

Accordingly, for the above reasons and for those discussed previously in connection with independent claims 28, 45, and 56, even if Markson were combined with Kleiman '591 and Kleiman '118, the resulting hypothetical combination still does not disclose or suggest each and every limitation of independent claim 28, 45, and 56 (i.e., using the map to reconstruct on the second computer system the internal logical volumes and file systems of the first computer system and mount a duplicate of the one or more volumes of data on the second computer system). Because the hypothetical combination of Kleiman '591, Kleiman '118 and Markson does not teach each and every limitation of the independent claims 28, 45, and 56, it cannot possibly teach each and every limitation of dependent claims 29-44, 46-55 and 57-68. Thus, Applicants maintain that claims 29-44, 46-55 and 57-68 are patentably distinguishable over Kleiman '591, Kleiman '118 and Markson, taken individually or in combination. Accordingly, Applicants respectfully request that the rejection of claims 29-44, 46-55 and 57-68 under 35 USC 103(a), over Kleiman '591, Kleiman '118 and Markson, be withdrawn.

Applicants submit that all dependent claims now depend on allowable independent claims.

It is believed that all of the pending claims have been addressed. However, the absence of a reply to a specific rejection, issue or comment does not signify agreement with or concession of that rejection, issue or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for withdrawing the prior art cited with regards to any or all pending claims (or other claims) that have not been expressed. Finally, nothing in this

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paper should be construed as intent to concede any issue with regard to any claim, except as specifically stated in this paper, and the amendment of any claim does not necessarily signify concession of unpatentability of the claim prior to its amendment.

Applicants submit that the entire application is now in condition for allowance. Such action is respectfully requested at the Examiner's earliest convenience.

All correspondence should be directed to the address below. Applicants' attorney can be reached by telephone at (781) 401-9988 ext. 122.

No fee is believed to be due for this Response; however, if any fees are due, please apply such fees to Deposit Account No. 50-0845 referencing Attorney Docket: EMC-038PUS.

Respectfully submitted,

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